Regional climate prediction (PRECIS)

Climate change will adversely affect developing countries whose economies are heavily dependent on agriculture and natural resources. It is vital that these countries are able to make their own future predictions and combine them with local knowledge. The PRECIS (Providing Regional Climates for Impacts Studies) system was developed at the Met Office Hadley Centre to provide a tool for predictions. It is made widely available to developing countries as an adaptation tool. It has been used extensively to inform national communications to the UNFCCC[1] by a number of non-Annex 1 countries[2], enabling them to be more influential in the climate change debate.

Adaptation to change will require high-quality climate change information, often with a lot of spatial detail. While global climate models are needed to understand and predict large-scale changes in climate they are not yet capable of providing the fine-scale information needed for some adaptation planning. This is because their horizontal resolution is too coarse to realistically include local climate forcings, such as mountains and inland water basins, or represent high-resolution climate phenomena such as fronts and cyclones. PRECIS generates high-resolution climate change information and can be applied in any region of the world.

[1] United Nations Framework Convention on Climate Change

[2] Mainly developing countries

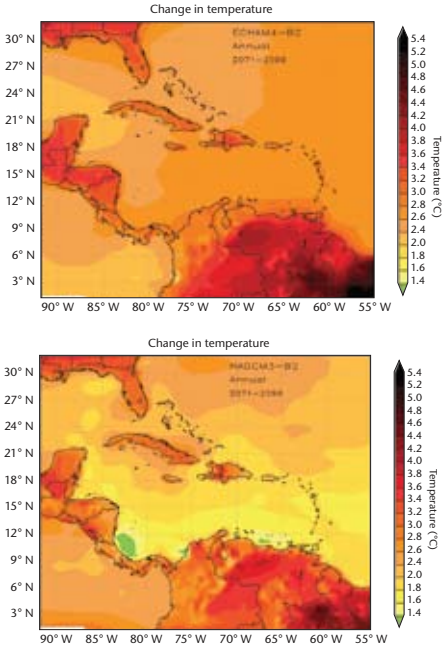

Figure: PRECIS projections of changes in near-surface temperature averaged over 2071–2099 compared to 1961–1990 for the SRES B2 IPCC emissions scenario using boundary conditions from Top: the Max-Planck Institute GCM (ECHAM4) and Bottom: the Met Office Hadley Centre GCM (HadCM3).[1]

Over the ocean and at the edges of the region covered it uses boundary conditions from global climate models. The system has recently been extended to enable users to explore the implications of uncertainties in the large-scale patterns of climate change. This is an important step in moving towards risk-based climate predictions.

CHANGES IN RAINFALL AND CROP YIELD IN THE CARIBBEAN AND CENTRAL AMERICA

One of the first applications of the assessment of uncertainty using PRECIS was in the Caribbean and Central America. PRECIS was run using boundary conditions from different global climate models (GCMs). The sea-surface temperatures are determined by the global models and are very different. The land temperatures are generated by the regional model and are remarkably similar.

In each case, annual average temperature increases of up to 4 °C by the end of the century are simulated over the land areas, even over the islands. A global model could not reproduce this, as it would not resolve the islands. The consistency of the land temperatures for the two projections gives extra credibility to the results.

Given this level of credibility, it was reasonable to explore the potential impact on key crops for a wide a range of possible changes in rainfall. In all cases yield was predicted to decrease, whether rainfall increased or decreased.

Crop	Temperature Change (°C)	% Change in Precipitation	Yield (kg/ha)	Change in Yield
Rice	0	0	3356	
	+2	+20	3014	-10%
	+2	-20	2888	-14%
Beans	0	0	1354	
	+2	+20	1164	-14%
	+2	-20	1093	-19%
Maize	0	0	4511	
	+2	+20	3737	-22%
	+2	-20	3759	-17%

Table: Simulated crop yields under current climate and with a 2 °C temperature increase accompanied by either a 20% increase or decrease in rainfall.

"This project represents a joint effort in the region to provide the policy makers with vital information. It is a fine example of the effectiveness of regional collaboration in helping us to meet global challenges such as those we may face with climate change. We, in the region, look forward to the further outputs from this commendable initiative and that no effort be spared, in ensuring the information is disseminated at all levels of the policy and decision-making in the Caribbean."[2]

The Hon. Said Musa
Prime Minister of Belize[3]

[1] Centella A., A. Bezanilla and K. R. Leslie, 2008: A Study of the Uncertainty in Future Caribbean Climate Using the PRECIS Regional Climate Model, Caribbean Community Climate Change Center, Belmopan, Belize 15 pp.

[2] From the foreword of Taylor, M.A., Centella, A., Charlery, J., Borrajero, I., Bezanilla, A., Campbell, J., Rivero, R., Stephenson, T.S., Whyte, F., Watson, R. (2007). Glimpses of the Future: A Briefing from the PRECIS Caribbean Climate Change Project, Caribbean Community Climate Change Centre, Belmopan, Belize 24 pp.

[3] With responsibility for Sustainable Development (including Environment and Disaster Management and Water) for CARICOM (Caribbean Community and Common Market).

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